Notice No.2

Rules and Regulations for the Classification of Ships, July 2019

The status of this Rule set is amended as shown and is now to be read in conjunction with this and prior Notices. Any corrigenda included in the Notice are effective immediately.

Please note that corrigenda amends to paragraphs, Tables and Figures are not shown in their entirety.

Issue date: November 2019

Amendments to	Effective date	IACS/IMO implementation (if applicable)
Part 3, Chapter 1, Section 6	1 January 2020	N/A
Part 3, Chapter 3, Section 2	1 January 2020	N/A
Part 3, Chapter 5, Section 3	1 January 2020	N/A
Part 3, Chapter 6, Section 3	1 January 2020	N/A
Part 3, Chapter 11, Sections 5 & 6	1 January 2020	N/A
Part 3, Chapter 12, Section 2	1 January 2020	N/A
Part 3, Chapter 13, Section 3	1 January 2020	N/A
Part 4, Chapter 1, Section 5	1 January 2020	N/A
Part 4, Chapter 3, Section 7	1 January 2020	1 January 2020
Part 4, Chapter 11, Sections 1, 7 & 9	1 January 2020	N/A
Part 4, Chapter 12, Section 2	1 January 2020	N/A

Lloyd's Register

Part 3, Chapter 1
General

■ *Section 6*
Definitions

6.6 Position 1 and Position 2

6.6.1 For the purpose of Load Line conditions of assignment, there are two basic positions of hatchways, doorways and ventilators defined as follows (*see also Figure 1.6.1 Position 1 and Position 2*):

~~Position 1 - Upon exposed freeboard and raised quarterdecks, and exposed superstructure decks within the forward 0,25 of the load line length.~~

~~Position 2 - Upon exposed superstructure decks abaft the forward 0,25 of the load line length and located at least one standard height of superstructure above the freeboard deck. Upon exposed superstructure decks situated within the forward 0,25 of the Load Line length and located at least two standard heights of superstructure above the freeboard deck.~~

Position 1:

- Exposed decks located abaft the forward 0,25 of the load line length, L_L, and less than one standard superstructure height above the freeboard deck.

- Exposed decks situated within the forward 0,25 of the load line length, L_L, and located less than two standard heights of superstructure above the freeboard deck.

Position 2:

- Exposed decks situated abaft the forward 0,25 of the load line length, L_L, and located at least one standard height of superstructure, but less than two standard heights of superstructure, above the freeboard deck.

- Exposed decks situated within the forward 0,25 of the load line length, L_L, and located at least two standard heights of superstructure, but less than three standard heights of superstructure, above the freeboard deck.

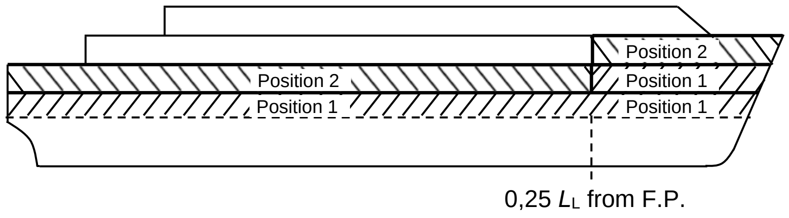

Figure 1.6.1 Position 1 and Position 2

Existing Figure 1.6.1 has been renumbered Figure 1.6.2.

Part 3, Chapter 3
Structural Design

■ *Section 2*
Rule structural concepts

2.5 Taper requirements for hull envelope

(Part only shown)

Table 3.2.1 Taper requirements for hull envelope

Item	Location	Requirement
Plating		
(1) Shell envelope plating, *see* Notes 1 and 2	Fore and aft ends	The thickness, in mm, is to be the greater of the following: (a) $\boldsymbol{t_{\cancel{t}\mathrm{t}} = \left[(t_{\cancel{c}\mathrm{c}} - t_{\cancel{e1}\mathrm{e1}})\left(1 - \frac{d}{0{,}225L}\right) + t_{\cancel{e1}\mathrm{e1}}\right]}$ (*see* Note 3) (b) ~~$\boldsymbol{t_t = (6,5 + 0,033L)\sqrt{\frac{ks_1}{s_b}}}$~~ $\boldsymbol{t_\mathrm{t} = (6,5 + 0,033L)f_2\sqrt{\frac{ks_1}{s_\mathrm{b}}}}$

Symbols

L, *k*, *s*, *T* as defined in *Pt 3, Ch 5, 1.4 Symbols and definitions 1.4.1*

d = distance, in m, from 0,2*L* forward or aft of amidships to the mid-length of the building block, strake, or longitudinal under consideration

s_b = standard frame spacing, in mm, as given in *Table 5.2.1 Strength/weather deck plating forward (excluding forecastle deck)* and *Table 5.3.1 Shell plating forward in Chapter 5*, and *Table 6.2.1 Strength/weather deck plating aft (excluding poop deck)* and *Table 6.3.1 Shell plating aft in Chapter 6*, as appropriate

s_1 = *s*, but is to be taken not less than s_b

t_c = actual thickness of deck or shell plating within the 0,4*L* midships region

t_{e1} = basic shell end thickness for taper and is ~~$\boldsymbol{(6,5 + 0,033L)\sqrt{k}}$~~ $\boldsymbol{(6,5 + 0,033L)f_2\sqrt{k}}$ at 0,075*L* from the A.P. or F.P.

t_{e2} = basic strength deck end thickness for taper and is $\boldsymbol{(5,5 + 0,02L)\sqrt{k}}$ at 0,075*L* from the A.P. or F.P.

t_t = taper thickness for strength deck and shell plating

Z_c = section modulus of deck longitudinal in association with deck plating, in cm^3, within the 0,4*L* midships region

Z_e = section modulus of deck longitudinal in association with deck plating, in cm^3, at 0,075*L* from the ends

Z_t = taper section modulus of deck longitudinal in association with deck plating, in cm^3

A_c = cross-sectional area of one longitudinal without attached plating, in cm^2, within the 0,4*L* midships region

A_e = cross-sectional area of one longitudinal without attached plating, in cm^2, at 0,075*L* from the ends

A_t = taper cross-sectional area of one longitudinal without attached plating, in cm^2

f_2 = factor to be taken as:

$\boldsymbol{f_2 = \left(\frac{15}{L/T}\right)^{0,2}}$ but need not be taken greater than 1. *L*/*T* is not to be taken greater than 25.

2.8 Rounding policy for plate thickness

2.8.1 Where plating thicknesses as determined by the Rules are required to be rounded, then this should be carried out to the nearest half millimetre, with thicknesses 0,75 mm and 0,25 mm being rounded up.
For example,

- for 10,75 ≤ t < 11,25 mm, the Rule required thickness is 11,0 mm;
- for 11,25 ≤ t < 11,75 mm, the Rule required thickness is 11,5 mm.

Part 3, Chapter 5
Fore End Structure

■ *Section 3*
Shell envelope plating

3.6 Shell openings

(Part only shown)

Table 5.3.1 Shell plating forward

Location	Thickness, in mm	Notes *(Part only shown)*
(1) Bottom shell and bilge, *see also* ~~1.5~~ *Pt 3, Ch 5, 1.5 Strengthening of bottom forward* and Note 5:		**Note** 1. For ships where *L* ≤ 70 m this thickness may be reduced by 1 mm, but is not to be less than 6 mm **Note** 2. The taper thickness is to be determined from *Table 3.2.1 Taper requirements for hull envelope*
(a) Forward of 0,075*L* from the F.P.	~~$t = (6{,}5 + 0{,}033L)\sqrt{\frac{ks_1}{s_b}}$~~ $t = (6{,}5 + 0{,}033L)f_2\sqrt{\frac{ks_1}{s_b}}$ (*see* Note 1)	
(b) Between 0,075*L* and 0,25*L* from the F.P., *see* Note 7	As (1)(a) or the taper thickness, whichever is greater	
(c) Aft of 0,25*L* from the F.P., *see* Note 7	The taper thickness, (*see* Note 2)	
(2) Side shell, *see* Notes 4 and 5		
(a) Forward of ~~0,75*L*~~ 0,075*L* from the F.P.	~~$t = (6{,}5 + 0{,}033L)\sqrt{\frac{ks_1}{s_b}}$~~ $t = (6{,}5 + 0{,}033L)f_2\sqrt{\frac{ks_1}{s_b}}$ (*see* Note 1)	
(b) Between 0,075*L* and 0,2*L* from the F.P., *see also Pt 3, Ch 5, 3.5 Side shell and sheerstrake 3.5.2*	As (2)(a) or the taper thickness, whichever is greater	
(c) Aft of 0,2*L* from the F.P.	The taper thickness, (*see* Note 2)	
(4) Forecastle, *see* Notes 4 and 5	~~$t = (7{,}0 + 0{,}02L)\sqrt{\frac{ks_1}{s_b}}$~~ $t = (7{,}0 + 0{,}02L)f_2\sqrt{\frac{ks_1}{s_b}}$	
Symbols		
L, B, D, T, s, k as defined in *Pt 3, Ch 5, 1.4 Symbols and definitions 1.4.1*		
f_2 = factor to be taken as: $f_2 = \left(\frac{15}{L/T}\right)^{0,2}$ but need not be taken greater than 1. *L/T* is not to be taken greater than 25.		
s_1 = *s*, but is to be taken not less than s_b		

Part 3, Chapter 6
Aft End Structure

■ *Section 3*
Shell envelope plating

3.5 Shell openings

(Part only shown)

Table 6.3.1 Shell plating aft

Location	Thickness, in mm	NOTES *(Part only shown)*
(1) Bottom shell and bilge, see Notes 4 and 5:		**Note** 1. For ships where *L* ≤ 70 m this thickness may be reduced by 1 mm, but is not to be less than 6 mm **Note** 2. The taper thickness is to be determined from *Table 3.2.1 Taper requirements for hull envelope, see* Note 7*.*
(a) Aft of 0,075*L* from the A.P.	~~$t = (6{,}5 + 0{,}033L)\sqrt{\frac{ks_1}{s_b}}$~~ $t = (6{,}5 + 0{,}033L)f_2\sqrt{\frac{ks_1}{s_b}}$ (*see* Note 1)	
(b) Between 0,075*L* and 0,15*L* from the A.P., *see* Note 6	As (1)(a) or the taper thickness, whichever is greater, *see* Note 2	
(c) Forward of 0,15*L* from the A.P., *see* Note 6	The taper thickness, *see* Note 2	
(2) Side shell, *see* Notes 4 and 5		
(a) Aft of 0,075*L* from the A.P.	~~$t = (6{,}5 + 0{,}033L)\sqrt{\frac{ks_1}{s_b}}$~~ $t = (6{,}5 + 0{,}033L)f_2\sqrt{\frac{ks_1}{s_b}}$ (*see* Note 1)	
(b) Between 0,075*L* and 0,15*L* from the A.P., *see also Pt 3, Ch 6, 3.4 Side shell and sheerstrake 3.4.2*	As (2)(a) or the taper thickness, whichever is greater, *see* Note 2	
(c) Forward of 0,15*L* from the A.P.	The taper thickness, *see* Note 2	
(4) Poop, *see* Notes 4 and 5	~~$t = (6{,}5 + 0{,}017L)\sqrt{\frac{ks_1}{s_b}}$~~ $t = (6{,}5 + 0{,}017L)f_2\sqrt{\frac{ks_1}{s_b}}$	

Symbols

L, B, D, T, s, k, as defined in *Pt 3, Ch 6, 1.4 Symbols and definitions 1.4.1*

$\boldsymbol{f_2}$ = factor to be taken as:

$\boldsymbol{f_2} = \left(\frac{\mathbf{15}}{\boldsymbol{L/T}}\right)^{\mathbf{0,2}}$ but need not be taken greater than 1. *L/T* is not to be taken greater than 25.

s_1 = *s*, but is to be taken not less than s_b

Part 3, Chapter 11
Closing Arrangements for Shell, Deck and Bulkheads

■ *Section 5*
Hatch coamings

5.1 General

5.1.2 Where hatches in locations above Position 2 are included in the consideration of intact and damage stability or are in critical locations above Position 2, then the height of hatch coamings is to be specially considered.

Existing paragraphs 5.1.2 to 5.1.3 have been renumbered 5.1.3 to 5.1.4.

■ *Section 6*
Miscellaneous openings

6.4 Companionways, doors and accesses on weather decks

6.4.4 Fixed lights in doors ~~in Positions 1 and 2~~ are to comply with the requirements for side scuttles as given in *Pt 3, Ch 11, 6.5 Side scuttles, windows and skylights 6.5.1* and *Pt 3, Ch 11, 6.5 Side scuttles, windows and skylights 6.5.2*. Hinged steel deadlights may be external.

6.4.5 The height of doorway sills above deck sheathing of access openings in bulkheads at ends of enclosed superstructures is to be not less than 600 mm in Position 1 and not less than 380 mm otherwise.

Existing paragraphs 6.4.5 to 6.4.9 have been renumbered 6.4.6 to 6.4.10.

6.4.11 Where doors in locations above Position 2 are included in the consideration of intact and damage stability or are in critical locations above Position 2, then the height of door sills is to be specially considered.

Existing paragraphs 6.4.11 to 6.4.16 have been renumbered 6.4.12 to 6.4.18.

Part 3, Chapter 12
Ventilators, Air Pipes and Discharges

■ *Section 2*
Ventilators

2.2 Coamings

2.2.2 Where ventilators in locations above Position 2 are included in the consideration of intact and damage stability or are in critical locations above Position 2, then the height of ventilator coamings is to be specially considered.

Existing paragraphs 2.2.2 to 2.2.5 have been renumbered 2.2.3 to 2.2.6.

Part 3, Chapter 13
Ship Control Systems

■ *Section 3*
Fixed and steering nozzles

3.2 Design pressure

3.2.1 The design pressure for propeller nozzles, in kN/m^2, is to be determined as follows:

$P_{\mathrm{d}} = c_{\mathrm{z}} P_{\mathrm{d0}}$

$P_{\mathrm{d0}} = 9 + 0{,}0025 N \delta_{\mathrm{p}}$ for $N_{\mathrm{N}} \leq 63$

$P_{\mathrm{d0}} = 13 + 0{,}002 N \delta_{\mathrm{p}}$ for $63 < N_{\mathrm{N}} \leq 200$

$P_{\mathrm{d0}} = \varepsilon c_f \frac{N}{A_{\mathrm{p}}}$ for $N_{\mathrm{N}} > 200$

where

N_{N} is the nozzle numeral

= $0{,}01 N \delta_{\mathrm{p}}$

N is the maximum shaft power in kW

A_{p} is the propeller disc area, in m^2, taken equal to:

= $\frac{\pi \delta_{\mathrm{p}}^2}{4}$

δ_{p} is the propeller diameter in m

ε is a factor obtained from the following formula:

= $0{,}21 - 2 \times 10^{-4} \frac{N}{A_{\mathrm{p}}}$ but not to be taken less than 0,1

c_z is a coefficient taken equal to:

c_z = 1,0 in Zone 2 (propeller zone)

c_z = 0,5 in Zone 1

See also Figure 13.3.1 Nozzle construction

c_{f} is a coefficient taken equal to:

c_{f} = 1,0 for fixed nozzles

c_{f} = 1,25 for steering nozzles

3.3 Nozzle scantlings

Table 13.3.1 Nozzle construction

Item	Requirement
(1) Nozzle plating	~~$t = 5s\sqrt{P_d} + t_k$~~ $t = 5s\sqrt{P_{\mathrm{d}} k} + t_{\mathrm{k}}$ but not less than 7,5 mm
(2) Ring webs and web stiffeners	Not less than the attached nozzle plating in way of Zone 1
(3) Webs in way of headbox and pintle support structure	$t_{\mathrm{w}} = t + 4$ mm
(4) Section modulus of nozzle profile about its neutral axis	$Z = n \delta_{\mathrm{p}}^2 L_{\mathrm{d}} V^2$ cm^3
Symbols	
P~~*d*~~$_{\mathrm{d}}$ = nozzle design pressure, in kN/m^2, *see Pt 3, Ch 13, 3.2 Design pressure* t = thickness of nozzle plating, in mm t_{w} = thickness of web plating, in mm s = spacing of web rings, in m k = material factor, as defined in *Pt 3, Ch 13, 1.2 General symbols* t_{k} = corrosion thickness, to be taken as:	

t_k = 2,5 in general

t_k = 1,5 for fresh water environments

t_k = ~~1,0~~ 0 for stainless steel

δ_p = propeller diameter, in m

L_d = nozzle length, in m

n = coefficient taken equal to:

n = 1,0 for steering nozzles

n = 0,7 for fixed nozzles

V is as defined in *Pt 3, Ch 1, 6.1 Principal particulars*

Part 4, Chapter 1
General Cargo Ships

■ *Section 5*
Shell envelope plating

5.4 Side shell

(Part only shown)

Table 1.5.2 Bottom shell and bilge plating

Note *1.* The thickness derived in accordance with (1) is also to satisfy the buckling requirements of *Pt 3, Ch 4, 7 Hull buckling strength.*

Note *2*. The thickness of bottom shell or bilge plating is to be not less than the basic shell end thickness for taper as given in *Pt 3, Ch 3 Structural Design, Table 3.2.1 Taper requirements for hull envelope*. ~~The basic shell end thickness for taper applied to the midship region bottom shell or bilge plating not be taken greater than 16 mm.~~

Note *3*. Where longitudinally framed and the lowest side longitudinal lies a distance *a* mm above the uppermost turn of bilge and/or the outermost bottom longitudinal lies a distance *b* inboard of the lower turn of bilge, the bilge radius is to be taken as $R_B + \frac{a+b}{2}$ mm. In no case is *a* or *b* to be greater than *s*.

Note *4*. Where separate maximum sagging and hogging still water bending moments are assigned, F_B, may be based on the hogging moment.

(Part only shown)

Table 1.5.3 Side shell plating

Location	Minimum thickness, in mm	
	Longitudinal framing	Transverse framing
(1) Side shell clear of sheerstrake, *see* Notes 1, 2~~, 4 and 5~~ and 4	(a) Above $\frac{D}{2}$ from base: The greater of the following: (i) $t = 0{,}001 s_1 \left(0{,}059 L_1 + 7\sqrt{\frac{F_D}{k_L}}\right)$ (ii) $t = 0{,}0042 s_1 \sqrt{h_{T1} k}$	(a) Within $\frac{D}{4}$ from the gunwale: The greater of the following: (i) $t = 0{,}00085 s_1 f_1 \left(0{,}083 L_1 + 10\sqrt{\frac{F_D}{k_L}}\right)$ (ii) $t = 0{,}0042 s_1 \sqrt{h_{T1} k}$
(2) Sheerstrake, see Notes 1, 2 and ~~5~~4	The greater of the following: (i) $t = 0{,}001 s_1 \left(0{,}059 L_1 + 7\sqrt{\frac{F_D}{k_L}}\right)$ (ii) $t = 0{,}00083 s_1 \sqrt{Lk} + 2{,}5$	The greater of the following: (i) $t = 0{,}001 s_1 f_1 \left(0{,}083 L_1 + 10\sqrt{\frac{F_D}{k_L}}\right)$ (ii) $t = 0{,}001 s_1 \sqrt{Lk} + 2{,}5$
Notes		
Note *2*. The thickness of side shell or sheerstrake plating is to be not less than the basic shell end thickness for taper as given in *Pt 3, Ch 3 Structural Design, Table 3.2.1 Taper requirements for hull envelope*. ~~The basic shell end thickness for taper applied to the midship region side shell or sheerstrake plating need not be taken greater than 16 mm.~~ The width of the		

sheerstrake (where of different thickness from the side shell) is to be not less than that required by *Table 2.2.1 Material classes and grades* in *Pt 3, Ch 2 Materials.*

Part 4, Chapter 3
Tugs

■ *Section 7*
Towing arrangements

7.1 Towing equipment

7.1.4 The emergency release systems provided on towing winches that are used for towing ships within close quarters, ports or terminals, are also to comply with the requirements specified in *Pt 7, Ch 16 Towing Winch Emergency Release Systems.*

Part 4, Chapter 11
Ore Carriers

■ *Section 1*
General

1.3 Class notation

1.3.4 The notation **Strengthened to carry cargoes which may liquefy (IMSBC Group A)** serves to identify the ship as being specially constructed for loads from Group A cargoes, as defined in the IMSBC Code. ~~To be eligible for this notation, the following structures are to be assessed, taking the greater of the calculated scantlings:~~

- ~~(a) The longitudinal bulkheads:~~
  - ~~i. by applying cargo pressure according to *Table 9.6.1 Inner hull and longitudinal oiltight bulkhead scantlings*;~~
    - ~~For the loading condition full load/partially filled.~~
    - ~~The density used for the full load/partially filled condition is to be agreed between the Owner and Builder and is to be noted in the Loading Manual by stating 'Carriage of cargo with moisture content above TML shall only be undertaken if the cargo density is above <density> tonne/m^3.'~~
    - ~~The results are to be corrected for density by applying a factor of $\rho_c/_{1,025}$ to the load height.~~
  - ~~ii. by applying ballast water content according to *Table 9.6.1 Inner hull and longitudinal oiltight bulkhead scantlings* for cargo hold boundaries assessed for full ballast hold filling;~~
  - ~~iii. by applying cargo pressure according to *Pt 4, Ch 11, 7.1 General 7.1.2*:~~
    - ~~For the loading conditions full load/fully filled and full load/partially filled.~~
    - ~~The cargo density used for the full load/fully filled condition is a virtual density based on homogeneous load at maximum draught.~~
    - ~~The density used for the full load/partially filled condition is to be agreed between the Owner and Builder and is to be noted in the Loading Manual by stating 'Carriage of cargo with moisture content above TML may only be undertaken if the cargo density is above <density> tonne/m^3.'~~
    - ~~With K_c = 1.~~
- ~~(b) Intersection of continuous secondary and primary members according to *Pt 3, Ch 10, 5.2 Arrangements at intersections of continuous secondary and primary members* using loads in the same section from *Pt 3 Ship Structures (General), Table 10.5.1 Total load transmitted to connection of secondary members* with K_c = 1.~~
- ~~(c) Cross ties in wing tanks as per requirements in this Chapter.~~
- ~~(d) Transverse bulkheads:~~
  - ~~i. by applying cargo pressure according to *Table 9.7.1 Transverse oiltight bulkhead scantlings*;~~
    - ~~For the loading condition full load/partially filled.~~
    - ~~The density used for the full load/partially filled condition is to be agreed between the Owner and Builder and is to be noted in the Loading Manual by stating "Carriage of cargo with moisture content above TML may only be undertaken if the cargo density is above <density> tonne/m^3.".~~
    - ~~The results are to be corrected for density by applying a factor of $\rho_c/_{1,025}$ to the load height.~~
  - ~~ii. by applying ballast water content according to *Table 9.6.1 Inner hull and longitudinal oiltight bulkhead scantlings* for cargo hold boundaries assessed for full ballast hold filling.~~
  - ~~iii. by applying cargo pressure according to *Pt 4, Ch 11, 8.3 Transverse watertight bulkheads in centre holds*:~~
    - ~~for the loading conditions full load/fully filled and full load/partially filled.~~
    - ~~The cargo density used for the full load/fully filled condition is a virtual density based on homogeneous load at maximum draught.~~

- ~~The density used for the full load/partially filled condition is to be agreed between the Owner and Builder and is to be noted in the Loading Manual by stating "Carriage of cargo with moisture content above TML may only be undertaken if the cargo density is above <density> tonne/m^3."~~
- ~~With K_c = 1.~~

~~(e) Lower stool as per requirements for (d) Transverse bulkheads.~~

The loading condition cargo density, ρ_c, applicable to this notation is not to be less than the virtual homogeneous load density as calculated based on M_{Full} at maximum draught, *see Pt 4, Ch 7, 1.8 Symbols and definitions.* The virtual cargo density is calculated based on homogeneous cargo at maximum draught.

The density is to be agreed between the Owner and the Builder and is to be noted in the Loading Manual in this form: 'Carriage of cargo with moisture content above TML shall only be undertaken if the cargo density is above <density> t/m^3'.

To be eligible for this notation additional calculations are required to assess stresses from liquefied cargo. The following structures are to be assessed:

(a) Longitudinal bulkheads using one of the following cargo density cases:
- Assessment using virtual cargo density, i.e. fully filled:
  - According to *Table 9.6.1 Inner hull and longitudinal oiltight bulkhead scantlings* with the following considerations:
  - load height, *h,* measured up to the highest point of the hold; and
  - the results are to be corrected for density by applying a factor of ρ_c/1,025 to the load height.
- Assessment using cargo density higher than the virtual cargo density, i.e. partially filled:
  - According to *Table 9.6.1 Inner hull and longitudinal oiltight bulkhead scantlings* with the following considerations:
  - load height, *h*, measured up to the height of the cargo in the hold;
  - horizontal distance, b_1, measured from the calculation point to the centreline as the filling level allows. When the level of the liquefied cargo is above the hold corner after the ship is heeled over, b_1 is to be specially considered to ensure a correct increased load height, $h + R\ b_1$, in the heeled state with roll angle θ; and
  - the results are to be corrected for density by applying a factor of ρ_c/1,025 to the load height.

(b) Transverse bulkheads using one of the following cargo density cases:
- Assessment using virtual cargo density, i.e. fully filled:
  - According to *Table 9.7.1 Transverse oiltight bulkhead scantlings* with the following considerations:
  - load height, *h,* measured to the highest point of the hold; and
  - the results are to be corrected for density by applying a factor of ρ_c/1,025 to the load height.
- Assessment using cargo density higher than the virtual cargo density, i.e. partially filled:
  - According to *Table 9.7.1 Transverse oiltight bulkhead scantlings* with the following considerations:
  - load height, *h*, measured up to the height of the cargo in the hold;
  - horizontal distance, b_1, measured from the calculation point to the centreline as the filling level allows. When the level of the liquefied cargo is above the hold corner after the ship is heeled over, b_1 is to be specially considered to ensure a correct increased load height, $h + R\ b_1$, in the heeled state with roll angle θ; and
  - the results are to be corrected for density by applying a factor of ρ_c/1,025 to the load height.

(c) Intersection of continuous secondary and primary members according to *Pt 3, Ch 10, 5.2 Arrangements at intersections of continuous secondary and primary members* using loads in the same Section from *Table 10.5.1 Total load transmitted to connection of secondary members (3)(b)(iii)* in *Pt 3 Ship Structures (General)* with K_c = 1.

(d) Cross ties in wing tanks as per requirements for primary structure in this Chapter.

(e) Lower stool as per requirements for (b) transverse bulkheads.

Additionally, the vessel is to be designed in accordance with LR's ~~*ShipRight Procedure Additional Design procedures, Procedure for Assessment of Ore Carriers filled with Liquefied Cargoes*~~ *ShipRight SDA Procedure for Primary Structures of Ore Carriers*.

■ *Section 7*
Longitudinal bulkheads

7.1 General

~~7.1.3 Cargo hold boundary scantlings are to be additionally assessed against ore loading in accordance with *Table 11.7.1 Longitudinal and transverse bulkhead scantlings for ore loading with load cases* as specified in *Pt 4, Ch 11, 1.3 Class notation 1.3.5* for a vessel eligible for the notation **Strengthened to carry cargoes which may liquefy (IMSBC Group A)**.~~

Existing paragraphs 7.1.4 to 7.1.6 have been renumbered 7.1.3 to 7.1.5.

(Part only shown)

Table 11.7.1 Longitudinal and transverse bulkhead scantlings for ore loading

K_c	= 0 for top side tank, upper deck and sloped upper stool
	~~= 1 in the assessment for the notation **Strengthened to carry cargoes which may liquefy (IMSBC Group A)**~~

■ *Section 9*
Primary structure in wing tanks

9.3 Cross ties in wing tanks

9.3.3 Actual wing tank cross tie area A_{cl}, in cm^2, is to satisfy:

$A_{\mathrm{cl}} \geq f_{\mathrm{liq}} A_{\mathrm{c}}$

Where:

A_{c} = Area of cross tie, in cm^2, *see Pt 4, Ch 11, 9.5 Cross-ties 9.5.1*

f_{liq} = $0{,}5 + \frac{f_{\cancel{\mathrm{b}}\mathrm{lc}}}{2{,}025\,C}$ and is not to be taken less than 1,0.

Where:

C = stowage rate, in ~~m^3/tonne~~ m^3/t

The stowage rate is defined in *Table 11.7.1 Longitudinal and transverse bulkhead scantlings for ore loading* but need not take into account the cargo overshoot defined in *Pt 4, Ch 11, 13.4 Cargo loading conditions for design assessment 13.4.1.(e)*.

$f_{\cancel{\mathrm{p}}\mathrm{lc}}$ = 1,0

If the cargo density of the intended loading condition is higher than the virtual cargo density ~~of the fully filled/full load density with homogeneous load at maximum draft~~, *see Pt 4, Ch 11, 1.3 Class notation 1.3.4*, then f_{p} is to be taken as (see also *Pt4, Ch 11, 1.3 Class notation 1.3.4*):

$f_{\cancel{\mathrm{p}}\mathrm{lc}}$ = $\frac{C h_{\cancel{\mathrm{p}}\mathrm{lc}}\,\rho_{\cancel{\mathrm{p}}\mathrm{lc}}}{h_{\mathrm{c}}}$ but is not to be taken less than 0,0 and need to be taken greater than 1,0.

Where:

$\rho_{\cancel{\mathrm{p}}\mathrm{lc}}$ = ~~The full load/partially filled~~ the loading condition cargo density (*see Pt 4, Ch 11, 1.3 Class notation 1.3.4*), in t/m^3

$h_{\cancel{\mathrm{p}}\mathrm{lc}}$ = the vertical distance from the centre of the cross tie to the level cargo surface ~~of partial filling of the maximum cargo mass~~, in m, ~~of~~ with the ~~full load/partially filled~~ loading condition density ~~(see *Pt 4, Ch 11, 1.3 Class notation 1.3.4*)~~ in an upright condition. The ~~maximum cargo mass~~ determination of cargo surface height need not take into account the cargo overshoot defined in *Pt 4, Ch 11, 13.4 Cargo loading conditions for design assessment 13.4.1(e)*.

h_{c} = the vertical distance from the centre of the cross-ties to deck at side amidships, in metres.

Part 4, Chapter 12
Dredging and Reclamation Craft

■ *Section 2*
Longitudinal strength

2.4 Design vertical wave bending moments

2.4.1 ~~The~~ For the transit conditions at draught T, the design vertical wave bending moment at amidships, M_{w}, is to be determined from *Pt 3, Ch 4, 5.2 Design vertical wave bending moments* with the ship service factor, f_1, given in *Table 12.2.1 Ship service factors f_1 and f_{wd}*.

2.4.2 ~~The~~ For the dredging conditions at draught T_{m}, the design hull vertical wave bending moment at amidships ~~for dredging conditions~~, M_{wd}, ~~where draught T_{m} is greater than T,~~ is given by the following expression:

$M_{\mathrm{wd}} = f_{\mathrm{wd}} f_2 M_{\mathrm{wo}}$

where

T_{m} is the dredging draught and is not to be taken less than draught, T

M_{wo} is determined from *Pt 3, Ch 4, 5.2 Design vertical wave bending moments*, using C_{bm} in place of C_{b}

f_2 is given in *Pt 3, Ch 4, 5.2 Design vertical wave bending moments*

f_1 and f_{wd} are defined in *Table 12.2.1 Ship service factors f_1 and f_{wd}*.

Table 12.2.1 Ship service factors f_1 and f_{wd}

Class Notation	f_1	f_{wd}
~~+~~ ✠ **100A1…**, dredging draught T_{m} of … metres in sea state with H_{s} < … metres	1,00	f_{uds}
~~+~~ ✠ **100-A1…**, dredging within 21 miles from shore at a dredging draught T_{m} of … metres	0,75	0,60
~~+~~ ✠ **A1…, Protected waters service**	0,65	0,35
Symbols		
$f_{\mathrm{uds}} = 2{,}2 H_{\mathrm{s}} L^{-0{,}48}$, not to be taken less than 0,35 nor greater than 1 H_{s} = significant wave height for the dredging operation at the considered dredging draught T_{m}		
Note The wave reduction factors may only be used for dredgers complying with the applicable requirements of *Pt 4, Ch 12, 1.6 Requirements for dredgers operating at reduced freeboard 1.6.1*.		

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